WHAT IS CLAIMED IS:

1. A method for determining the presence or concentration of a substance in a medium, the method comprising:

a) providing a sensor in the medium, wherein the sensor includes at least one optical carrier and a microsphere having a surface including receptors for the substance, each of the at least one optical carrier being coupled with the microsphere;

b) applying a light source to one of the at least one optical carriers of the sensor;

c) detecting a transmission spectra of light from one of the at least one optical carriers of the sensor; and

d) determining a presence or concentration of the substance based on a change in the transmission spectra the detected light.

2. The method of claim 1 further comprising:

- determining a change in the transmission spectra of the light due to a factor other than adsorption of the substance onto the surface of the microsphere,

wherein the act of determining a presence or concentration of the substance based on a property of the detected light, wherein the property is based on a change in the transmission spectra of the light, compensates for the determined change in the transmission spectra of the light due to a factor other than adsorption of the substance onto the surface of the microsphere.

3. The method of claim 2 wherein the sensor includes a second microsphere coupled with each of the at least one

optical carrier,

wherein the second microsphere has a surface that is free of receptors for the substance, and

wherein the act of determining a change in the transmission spectra of the light due to a factor other than adsorption of the substance on the surface of the microsphere is based on a change in the transmission spectra of the light due to the second microsphere.

4. A system for determining the presence or concentration of a substance in a medium, the system comprising:

a) a sensor, for immersion in the medium, the sensor including

i) at least one optical carrier, and

ii) a microsphere having a surface including receptors for the substance, each of the at least one optical carrier being coupled with the microsphere;

b) a light source for applying light to one of the at least one optical carriers of the sensor;

c) a detector for detecting light from one of the at least one optical carriers of the sensor; and

d) means for determining a presence or concentration of the substance using a shift in the transmission spectra of the detected light.

5. The system of claim 4 wherein the sensor further includes

iii) a second microsphere coupled with each of the at least one optical carrier, wherein the second microsphere has a surface that is free of

receptors for the substance.

6. For use in a system including a light source, and a light detector, for determining the presence or concentration of an explosive substance in a medium, a sensor comprising:

a) at least one optical fiber;

b) at least one microsphere, the at least one microsphere

i) being coupled with the optical fiber, and

ii) having a surface including receptors for the substance, wherein the receptors include polyaromatic compounds.

7. The sensor of claim 6 wherein the polyaromatic compounds are pyrenes.

8. The sensor of claim 6 wherein the explosive substance is TNT.

9. For use in a system including a light source, and a light detector, for determining the presence or concentration of a poison gas in a medium, a sensor comprising:

a) at least one optical fiber;

b) at least one microsphere, the at least one microsphere

i) being coupled with the optical fiber,

ii) having a surface including receptors for the substance, wherein the receptors include EU^{3+} chelate.

10. The sensor of claim 6 wherein the poison gas is Soman.

11. A method for fabricating a sensor for determining the presence or concentration of an explosive substance in a medium, the method comprising:

a) bridging at least one microsphere and an at least one optical core; and

b) functionalizing a surface of the microsphere with polyaromatic compound receptors.

12. The method of claim 11, wherein the polyaromatic compound receptors include pyrenes.

13. The method of claim 12, wherein the act of functionalizing the microsphere surface with pyrene receptors includes:

i) reacting pyrene butanol with dichlorodimethlsilane to generate a product, and

ii) reacting the product with a silanol on the surface of the microsphere.

14. The method of claim 13 wherein the explosive substance is TNT.

15. A method for fabricating a sensor for determining the presence or concentration of a poison gas in a medium, the method comprising:

a) bridging at least one microsphere and an at least one optical core; and

b) functionalizing a surface of the microsphere with EU^{3+} chelate receptors.

16. The method of claim 15, wherein the act of functionalizing the microsphere surface with EU^{3+} chelate receptors includes reacting diketon with an amine on the surface of the microsphere.

17. The method of claim 15 wherein the poison gas is Soman.